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AUTHOR Halpin, Regina

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ABSTRACT

The effective use of technology in the classroom has become a focal emphasis in K-12 schools. Because of this emphasis, teacher education programs are expected to provide future teachers with an education that includes teaching specific content areas as well as an opportunity to become computer literate. During two semesters, pre- and post-questionnaires were administered to 73 preservice teachers completing integrated elementary methods courses in mathematics, science, social studies, and language arts. The pre-questionnaire was designed to assess students' computer skills before entering the senior method courses. Then, each of the 73 teachers were tracked at the end of their first year of teaching to assess how frequently they were using the technology as an instructional tool and for what purposes. Only 56 of the 73 preservice teachers were found to have completed one year of teaching. The results of this study provide valuable information for teacher education programs seeking ways to increase the probability that teachers will transfer computer skills into their classroom. (Author/AEF)

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ED 419 498

Paper Session

Computer Literacy Taught Through Student-Centered Activities in Elementary Teacher Education: Constructivist Theory Put Into Practice

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Regina Halpin
Box 9705
Mississippi State University
Mississippi State, MS 39762
601.325.7117
rhalpin@ra.msstate.edu

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Abstract

The effective use of technology in the classroom has become a focal emphasis in K–12 schools. Because of this emphasis, teacher education programs are expected to provide future teachers with an education that includes teaching specific content areas as well as becoming computer literate. But what is the definition of computer literacy and how does one become computer literate? Are teachers computer literate if they are knowledgeable of computer terminology and can perform basic tasks, such as using a word processor for making out tests or searching the World Wide Web? And most importantly, which comes first, the theory or the practice? Or can the two be taught simultaneously?

During two semesters, pre- and post-questionnaires were administered to 73 preservice teachers completing an integrated elementary method courses in mathematics, science, social studies, and language arts. The pre-questionnaire was designed to assess students' computer skills before entering the senior method courses. Then, each of the 73 teachers were tracked at the end of their first year of teaching to assess how frequently they were using technology as an instructional tool and for what purposes. Only 56 of the 73 preservice teachers were found to have completed one year of teaching. The tracking questionnaire assessed how frequently they had used technology as an instructional tool, and a content analysis summarized how they were using technology as an instructional tool. The results of this study provide valuable information for teacher education programs seeking ways to increase the probability that teachers will transfer computer skills into their classrooms.

Background

Across the nation, teacher education programs have addressed this challenge in various ways and at different rates. The National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989) provide guidelines for preparing preservice teachers to teach mathematics so they enter into the classroom with the skills needed to compete in the 21st-century workforce. These guidelines can be applied across the curriculum

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because focus on exploration, problem solving, reasoning, connections, and communication supports the underlying constructivist philosophy. Curriculum standards in other disciplines emphasize the importance of producing computer literate teachers for the 21st century. The new standards focus on teachers encouraging students to explore and discover information using computer software, such as word processors, spreadsheets, electronic mail, and network browsers. Given this current emphasis for computer integration into precollege classroom instruction, the question arises whether the use of computers as an instructional resource should be taught in a separate course or integrated into the current courses in much the same manner as mathematics is integrated and taught based on the hands-on, exploratory methods supported by the constructivist philosophy.

As we enter the 21st century, educators agree that our future teachers will be faced with the challenge of knowing how to use computers. However, there are different definitions of computer literacy. Researchers have conducted studies to determine university students' degree of computer literacy, and each includes different computer applications as the baseline criteria (Blubaugh, 1988; Fox, Thompson, & Chan, 1996; Furst-Bowe, Boger, Franklin, McIntyre, Polansky, & Schlough, 1996; Russet, 1995; Sheffield, 1996; Thomas, Larson, Clift, & Levin, 1996). Furthermore, researchers have supported the integration of technology across teacher education courses as opposed to an isolated topic (Blubaugh, 1988; Brownell & Brownell, 1991; McEneaney, 1992; Schmidt, Merkley, Strong, & Thompson, 1994; Russett, 1995; Wetzel, 1993) and have found that teachers' attitudes toward computers affect their willingness to use technology in their classroom instruction (Boone & Gabel, 1994; Kluever, Lam, Hoffman, Green, & Swearingen, 1994; Hunt & Bohlin, 1993; McEneaney, 1992; Okinaka, 1992). Niess (1990) went a step further by developing a set of guidelines that can be applicable to all teachers, regardless of grade level or subject matter, for integrating computer-assisted instruction into the curriculum:

- fit the computer to the curriculum rather than the curriculum to the computer
- use the computer as a personal and professional tool
- use the computer in the learning of subject matter

These guidelines are important as teacher training programs are modified to incorporate components for training teachers to use technology. Too often teachers view computers as isolated instructional resources that require more time, above and beyond their normal instructional planning, to integrate as an instructional tool for meeting their current curriculum objectives (Thomas, Larson, Clift, & Levin, 1996; Thompson & Schmidt, 1994). On the contrary, the integration across the curriculum provides preservice teachers an exploratory and discovery environment to become confident in their ability to use different computer applications for instructional purposes. If it is true that preservice teachers will teach as they are taught, it becomes a necessity to determine the most effective way to train preservice teachers to enter into their own classrooms integrating technology appropriately.

Purpose and Objectives

The purpose of this study was to provide preservice teachers the opportunity to use

various computer applications for teaching math, science, social studies, and language arts while completing an integrated senior-level block of method courses. Then, determine the transfer rate of technology across the curriculum by those teachers who were taught simultaneously how to use computers as an instructional resource during a block of methods courses. The future teachers were tracked and surveyed after their first year of teaching experience to assess how much of the integrated technology training was still present as part of their teaching and how they were using the resources in the classroom.

To provide a problem-solving environment in the classroom, elementary teachers must feel confident in their ability to use computer applications as tools for solving problems. Thus, the primary focus of this study was to produce preservice teachers who were considered computer literate, which was determined based on their confidence in their ability to use computer applications (e.g., word processor, spreadsheet, e-mail, and the World Wide Web) as instructional tools during their first year of teaching. Research studies have reported that most preservice teachers entering today's teacher education programs are familiar with using a word processor (Fox et al., 1996; Sheffield, 1996) more than any other computer application. However, there has been a need to investigate the most effective approach for integrating computer training into preservice education (Waugh & Rath, 1995). Therefore, the objectives of this study were to expand the current research by (a) assessing elementary preservice teachers' computer skills when they enter into the integrated mathematics methods course, (b) determining if elementary preservice teachers' computer skills improve after completing a technology-integrated mathematics methods course, and (c) tracking the preservice teachers to determine how much of the technology integrated instruction was transferred into the classroom.

Method

During two semesters, pre- and post-questionnaires were administered to the preservice teachers completing an integrated elementary method courses in mathematics, science, social studies, and language arts. These courses were taught as a block of methods courses by four instructors. The pre-questionnaire was designed to assess students' computer skills before entering the senior block. The students were asked to choose from the following computer applications and to check all that they felt comfortable using: word processor, spreadsheet, e-mail, and World Wide Web browsers. This pre-information was used by two of the faculty to develop interdisciplinary instruction and assignments emphasizing the effective use of computer applications as instructional supplements to teach math and science. As part of the course, all students were provided an e-mail account to be used during the semester. At the end of each semester, the students completed a post-questionnaire. They responded how frequently they used the computer applications during the semester and their post-comfort level on using the computer applications in the classroom.

Description of Each Semester's Content

During each semester, the students could use computer applications to complete assignments in all four method courses but were only required to do so during the

fall semester. The assignments ranged from using the word processor for lesson plans and spreadsheets for graphing to communicating with peers and completing assignments using e-mail. As an example of an interdisciplinary assignment, an observational experiment and graphing assignment was designed by the math and science instructors. During the fall semester, the 40 students conducted an observational experiment as part of the science methods and graphed the results as part of the mathematics methods. The students were not shown how to use a spreadsheet. If they did not know how to use a spreadsheet, they could pair with a partner or explore individually to learn the basics of a spreadsheet; but the assignment required that they use a spreadsheet to complete the assignment. During the spring semester, the same assignment was given to the 33 students in the method courses. Again, the students were not introduced to spreadsheets, and, in addition, they were not required to use a spreadsheet to complete the assignment. The purpose was to assess if the students would transfer their computer skills and choose to use spreadsheets even though it was not a requirement of the assignment. At the conclusion of each semester, the post-questionnaire assessed how frequently they used technology during the semester and their post-comfort level on using the computer applications in the classroom.

Each of the 73 teachers were tracked at the end of their first year of teaching to assess how frequently they were using technology as an instructional tool and for what purposes. Only 56 of the 73 preservice teachers were found to have completed one year of teaching. The tracking questionnaire assessed how frequently they had used technology as an instructional tool, and a content analysis summarized how they were using technology as an instructional tool.

Results

The students' pre- and post-responses concerning their levels of comfort in using the various computer applications are given in Figure 1. As reported in the research, a majority (76%) of the 73 students reported they were comfortable using a word processor when they entered the semester. However, only 31 (42%) reported they were comfortable using e-mail and only 23 (31%) were comfortable using a World Wide Web browser. After completing the block of method courses, the students were more comfortable using all three computer applications in the classroom.

Figure 1. Students' Reported Ability to Use Computer Applications.

The students' pre- and post-responses for using spreadsheets are given in Figure 2. The purpose for reporting the preservice teachers' use of spreadsheets separately was to compare their pre-and post-responses to their ability to transfer their skills for using spreadsheets for instructional purposes based on whether they were required to use the application to complete an assignment.

Figure 2. Students' Reported Ability to Use Spreadsheets.

During the fall and spring semesters, 18 of the 40 students (45%) and 6 of the 33 students (18%), respectively, reported they were comfortable using a spreadsheet when they entered the block. During the fall semester when the students were required to complete the graphing assignment using the spreadsheet, 78% reported they were comfortable using spreadsheets by the end of the semester while only 45% responded in the same manner after having the option to choose their method of graphing. Of the 33 students during the spring semester, 13 (39%) chose to use the spreadsheet as a graphing tool even though it was not a requirement. The remaining students turned in hand-drawn graphs.

The students were asked how frequently they used the computer applications during the semester. It was not surprising that all of the students reported they used e-mail and word processors often because so much of their work required them to do so. However, the students' responses to their frequency for using spreadsheets supports the results previously reported. During the fall semester when the students were required to use spreadsheets for an assignment, the frequency of use was higher than during the spring when the use of a spreadsheet was optional. The use of a World Wide Web browser was approximately the same during both semesters, and this was expected considering the primary use was to option lesson ideas and plans to use in the classroom.

Table 1. Frequency Preservice Teachers Report Using Computer Applications

Fall	**None**	**Sometimes**	**Often**
word processor	0	3	37
spreadsheet	5	6	29
e-mail	0	0	40
World Wide Web	2	22	16
Spring	**None**	**Sometimes**	**Often**
word processor	0	0	33
spreadsheet	7	18	8
e-mail	0	0	33
World Wide Web	0	25	8

A content analysis was conducted to summarize the preservice teachers' reported uses of the computer applications as an instructional tool. The results suggested that the preservice teachers responded based primarily on what they had experienced during the semester. However, using the specific computer applications for enrichment and remediation were not discussed during the semester. Therefore, these responses reflected the preservice teachers' abilities to transfer their

knowledge for using technology in the classroom. The following categories summarized the preservice teachers' responses: instructional tool for students, research tool for students, enrichment/remediation tool; spreadsheets as a gradebook, World Wide Web for lesson planning, and e-mail for communicating with other teachers and students gathering data.

One year later, the teachers from the spring and fall semesters were tracked to determine if they were using technology as an instructional tool in the classroom and for what purposes. Of the 73 preservice teachers, only 56 were found to have completed one year of teaching. The tracking questionnaire asked the teachers if they were using technology in the classroom at least once a week as an instructional tool and to check all of the following computer applications that they had used: word processor, spreadsheet, e-mail, and World Wide Web browser. Of the 56 teachers, 31 (55%) reported they had used technology in the classroom at least once every week during their first year of teaching. Of the 25 reporting they had not used technology in the classroom, 19 reported the barrier was a lack of computers in their school. The remaining six teachers reported time constraints as a barrier. An additional telephone interview indicated that each of the six teachers did have access to computers in their schools. Their responses could have been an indication of the teachers not feeling as confident using the applications, and thus more time would have been required to integrate the technology into their classroom. All six of the teachers were in the spring semester group that were not required to use technology to complete their assignments. A final question was asked to determine how the teachers were using word processors, e-mail, and the World Wide Web in the classroom. The teachers were to list all of the ways that they had used each of the computer applications listed in Table 1. A content analysis was used to summarize their responses. The results are provided in Table 2.

Table 2. Frequency of Technology Use in the Classroom After First Year Teaching

Responses	Fall Teachers	Spring Teachers
Spreadsheets for student projects	30 (94%)	15 (63%)
Spreadsheets as a gradebook	25 (78%)	11 (46%)
Students using e-mail	27 (84%)	21 (88%)
Teachers using e-mail to communicate with colleagues/other professionals	15 (47%)	12 (50%)
Teacher prepared reports to parents	32 (100%)	18 (75%)
Lesson planning ideas from World Wide Web	31 (97%)	24 (100%)
Student research projects using World Wide Web	32 (100%)	24 (100%)

The tracking data indicated that the teachers entered into their first year of teaching with the confidence and knowledge to incorporate technology as an instructional or

professional tool into the classroom. Of the 32 teachers who had completed the method courses during the fall semester when the use of spreadsheets was required for completing assignments, 94% reported using the spreadsheet for students' use, while 78% reported using the spreadsheet as a gradebook. These results were greater than for those teachers who were not required to use a spreadsheet to complete the assignment: 63% and 46%, respectively. This supports the hypothesis that teaching computer literacy simultaneously with the methods courses promotes self-confidence among teachers to transfer their computer skills into the classroom. Further research needs to be done to determine whether this transfer rate is higher when compared to computer literacy being taught as a separate component from the methods courses.

Conclusions

The results of this study indicate that the integration of computer literacy in methods courses does provide future teachers the confidence to transfer their computer skills into their classrooms based on their own exploratory experiences. These results can assist other preservice education programs as modifications to elementary teacher education programs are made for integrating technology into the program such that preservice teachers enter the 21st-century classroom with the positive attitude and confidence needed to teach mathematics in a technological society. By observing the ways teachers reported using the computer as an instructional tool, the data suggest that it was important to integrate the use of computer applications into the already existing preservice methods courses to provide the teachers the opportunity to experience exactly how technology can be integrated into the daily operations of the classroom. Furthermore, the interdisciplinary approach provided the preservice teachers with the much needed emphasis on the importance of teaching math, science, social studies, and language arts concepts as integrated topics.

A note should be made concerning the importance of having an accessible computer laboratory at the university for the preservice teachers to use during their courses. This was a major problem during the fall semester because the preservice teachers found the computer laboratory closed at 5:00 p.m., and it was normally reserved for instructional purposes during the afternoons. For the spring semester, this problem was slightly improved when the computer laboratory extended the hours of operation until 9:00 p.m. and a public computer laboratory in the library was used by the students. However, the preservice teachers still commented that they do not have easy access to the computers during the afternoons. This was an important concern and should be addressed by preservice education programs before the use of computers are incorporated as a major component of the curriculum.

References

Boone, W., & Gabel, D. (1994). Computers and preservice elementary science teacher education. *Journal of Computers in Mathematics and Science Teaching*, 13(1), 17–42.

Blubaugh, W.L. (1988). A course designed to prepare teachers to better utilize computers. *School Science and Mathematics*, 88(4), 295–300.

Brownell, G., & Brownell, N. (1991). Designing tomorrow: Preparing teachers as change agents for the classroom of the future. *Computers in the Schools*, 8, 147–149.

Fox, L., Thompson, D., & Chan, C. (1996). Computers and curriculum integration in teacher education. *Action in Teacher Education*, 17(4), 64–73.

Furst-Bowe, J., Boger, C., Franklin, T., McIntyre, B., Polansky, J., & Schlough, S. (1996). An analysis of required computer competencies for university students. *Journal of Research on Computing in Education*, 28(2), 175–189.

Hunt, N.P., & Bohlin, R.M. (1993). Teacher education students' attitudes toward using computers. *Journal of Research on Computing in Education*, 25(4), 487–497.

Kluever, R., Lam, T., Hoffman, E., Green, K., & Swearingen, D. (1994). The computer attitude scale: Assessing changes in teachers' attitudes toward computers. *Journal of Educational Computing Research*, 11(3), 251–261.

McEneaney, J.E. (1992). *Preservice teachers' computer attitudes in non-computer classes*. (ERIC Document Reproductive Service No. ED 350 975)

Niess, M. (1990). Preparing computer-using educators for the 90s. *Journal of Computing in Teacher Education*, 7(2), 11–14.

National Council of Teachers of Mathematics Curriculum and Evaluation Standards for School Mathematics (1989). Reston, VA.

Okinaka, R. (1992). *The factors that affect teacher attitude towards computer use*. (ERIC Document Reproduction Service No. ED346 039)

Russett, J. (1995). Using telecommunications with preservice teachers. *Journal of Computers in Mathematics and Science Teaching*, 14, 65–75.

Schmidt, D., Merkley, D., Strong, M., & Thompson, A. (1994). An approach to technology integration for reading and language arts teacher education faculty. In J. Willis, B. Robin, & D.S. Willis (Eds.), *Technology and Teacher Education Annual* (pp. 773–778). Charlottesville, VA: Association for the Advancement of Computing in Education.

Sheffield, C.J. (1996). An examination of self-reported computer literacy skills of preservice teachers. *Action in Teacher Education*, 17(4), 45–52.

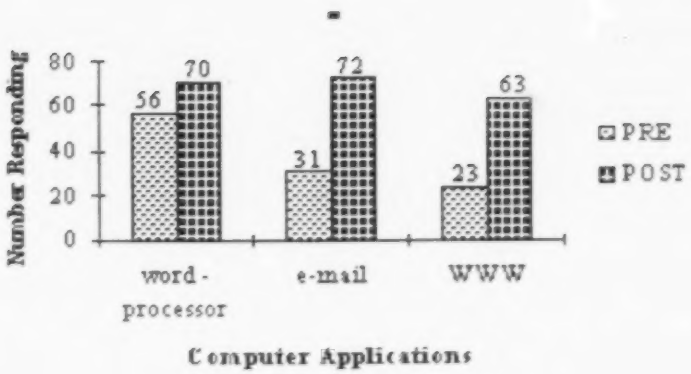
Thomas, L., Larson, A., Clift, R., & Levin, J. (1996). Integrating technology in teacher education programs: Lessons from the teaching teleapprenticeship project. *Action in Teacher Education*, 17(4), 1–7.

Thompson, A., & Schmidt, D. (1994). A three-year plan to infuse technology throughout a teacher education program: Year 3 update. In J. Willis, B. Robin, & D.A. Willis (Eds.), *Technology and Teacher Education Annual* (pp. 358–360). Charlottesville, VA: Association for the Advancement of Computing in Education.

Waugh, M.L., & Rath, A. (1995). Teleapprenticeships in an elementary science

methods class: A Description of Students' Network Experiences. *Journal of Computers in Mathematics and Science Teaching*, 14, 99–72.

Wetzel, K. (1993). Models for achieving computer competencies in preservice education. *Journal of Computing in Teacher Education*, 9(4), 4–6.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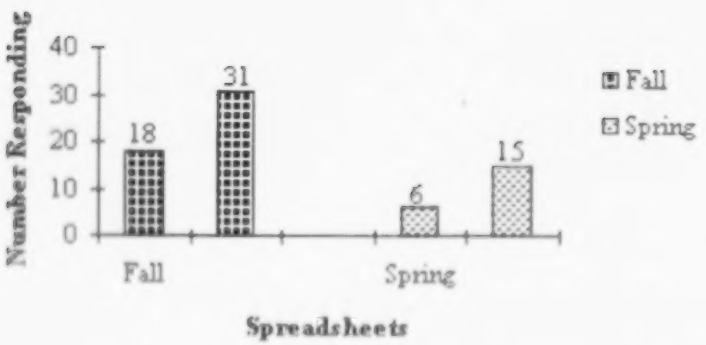
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